Digital Transformation of the Aerospace & Defense Factory
航空航天与国防行业工厂的数字化转型

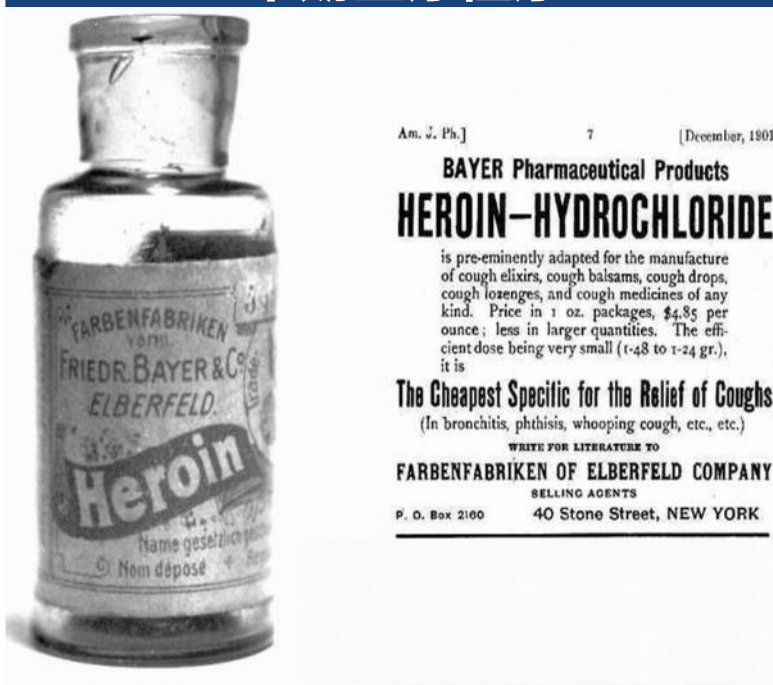
Agenda|大纲

- Traditional A&D production
  航空航天与国防工业的传统生产模式
- Digital transformation & the future A&D factory
  数字化转型和航空航天与国防企业的未来工厂规划
- Siemens Product Realization solution for A&D companies
  西门子面向航空航天与国防行业企业的“产品实现”解决方案
- Few examples – digital thread, advanced automation, VR, AR, additive manufacturing
  技术应用范例—数字主线、先进自动控制、虚拟现实、增强现实、增材制造

Since the... Ford Model T
从...福特T型车

First Airplanes
第一架客机

Early Medical Procedures
早期医疗程序



Am. J. Ph.] 7 [December, 1901

BAYER Pharmaceutical Products

HEROIN—HYDROCHLORIDE

is pre-eminently adapted for the manufacture of cough elixirs, cough balsams, cough drops, cough lozenges, and cough medicines of any kind. Price in 1 oz. packages, $4.85 per ounce; less in larger quantities. The efficient dose being very small (1-48 to 1-24 gr.), it is

The Cheapest Specific for the Relief of Coughs

(In bronchitis, phthisis, whooping cough, etc., etc.)

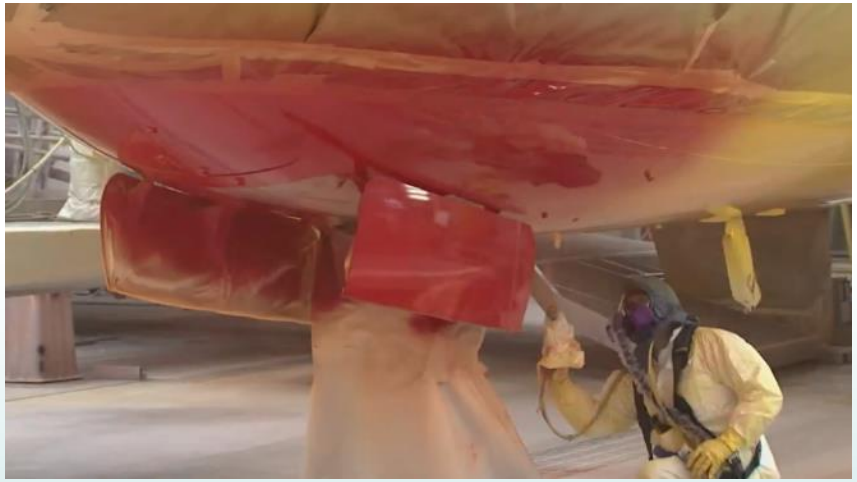
WRITE FOR LITERATURE TO

FARBENFABRIKEN OF ELBERFELD COMPANY

SELLING AGENTS

P. O. Box 2160 40 Stone Street, NEW YORK

The Typical Aerospace Factory
传统的航空航天制造工厂



Digital Transformation of Manufacturing
制造业的数字化转型

- Few companies, going through a **digital transformation**, disrupt industries with their innovation!
  少数企业成功完成**数字化转型**，用其带来的创新能力成为激烈行业竞争的破局者！

- Others are left behind, continuing ‘business as usual’, but for how long?
  剩下的企业却被远远地抛在后面，虽可“一如常往”，但能持续多久？

‘Future Factory’ - Country Initiatives
“未来工厂”—各类国家计划层出不穷

Realize LIVE GREATER CHINA

America Makes

DE.DIGITAL

MADE IN CHINA 中国制造 2025

Smart Nation SINGAPORE

Alliance INDUSTRIE DU FUTUR

PIANO INDUSTRIA 4.0

Robot Revolution & Industrial IoT Initiative
ロボット革命イニシアティブ協議会

Australian Government | The Prime Minister's Industry 4.0 Taskforce

Digital Transformation - the 4th Industrial Revolution
数字化转型--第四次工业革命

Realize LIVE GREATER CHINA

1st Industrial Revolution
Water and steam
水力与蒸汽机

2nd Industrial Revolution
Electricity, mass production
电气化、大规模生产

3th Industrial Revolution
Automation
自动化

4th Industrial Revolution
Digitalization
数字化

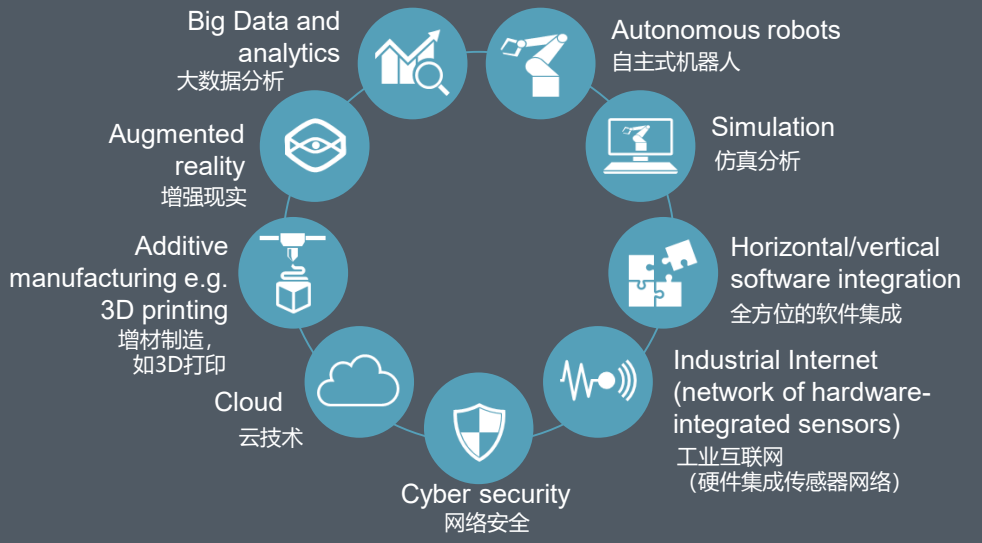
Characteristics 特征

Production network
网络化生产

Fusion of virtual and real world
虚拟世界与现实世界的融合

Cyber-physical systems
信息物理系统

Technologies 技术



Sources: BITKOM, BCG
参考资料：德国信息技术、通讯、新媒体协会, 波士顿咨询公司

The A&D Industry is Talking About…
航空航天与国防行业正在热议

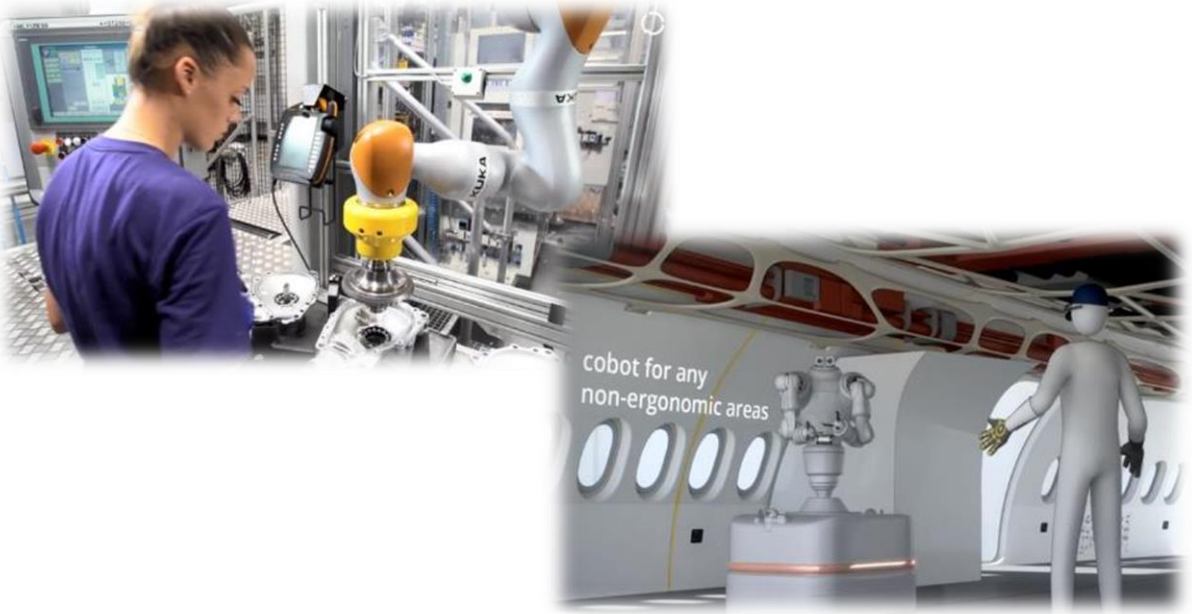
Realize LIVE GREATER CHINA

Paperless production
无纸化生产

Lean manufacturing - Eliminate waste,
Minimize non-value added
精益生产—消除浪费，尽量减少非增值环节

MBE (Model Based Engineering)
MBE (基于模型的工程)

The Future Aerospace Factory
未来的航空航天制造工厂



- Smart|智能
- Connected|互联
- Transparent|透明
- Flexible, and more tolerant to
  - Product changes
  - Demand fluctuations

  柔性，更加能够适应产品变更和需求变化
- Leveraging advanced manufacturing technologies

  综合利用各种先进的制造技术

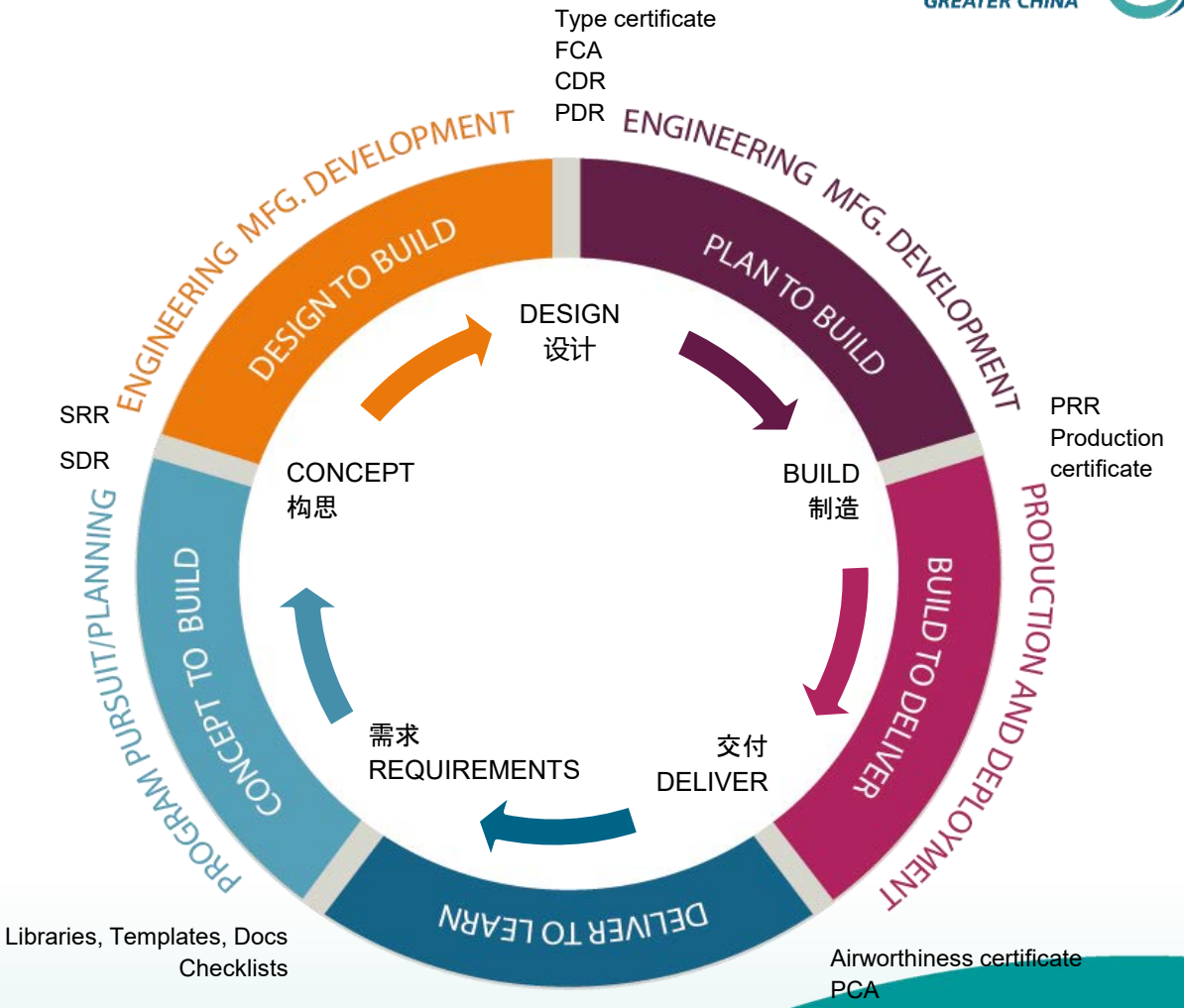
Digitalize the Product Realization Process
将产品流程数字化

Realize LIVE GREATER CHINA

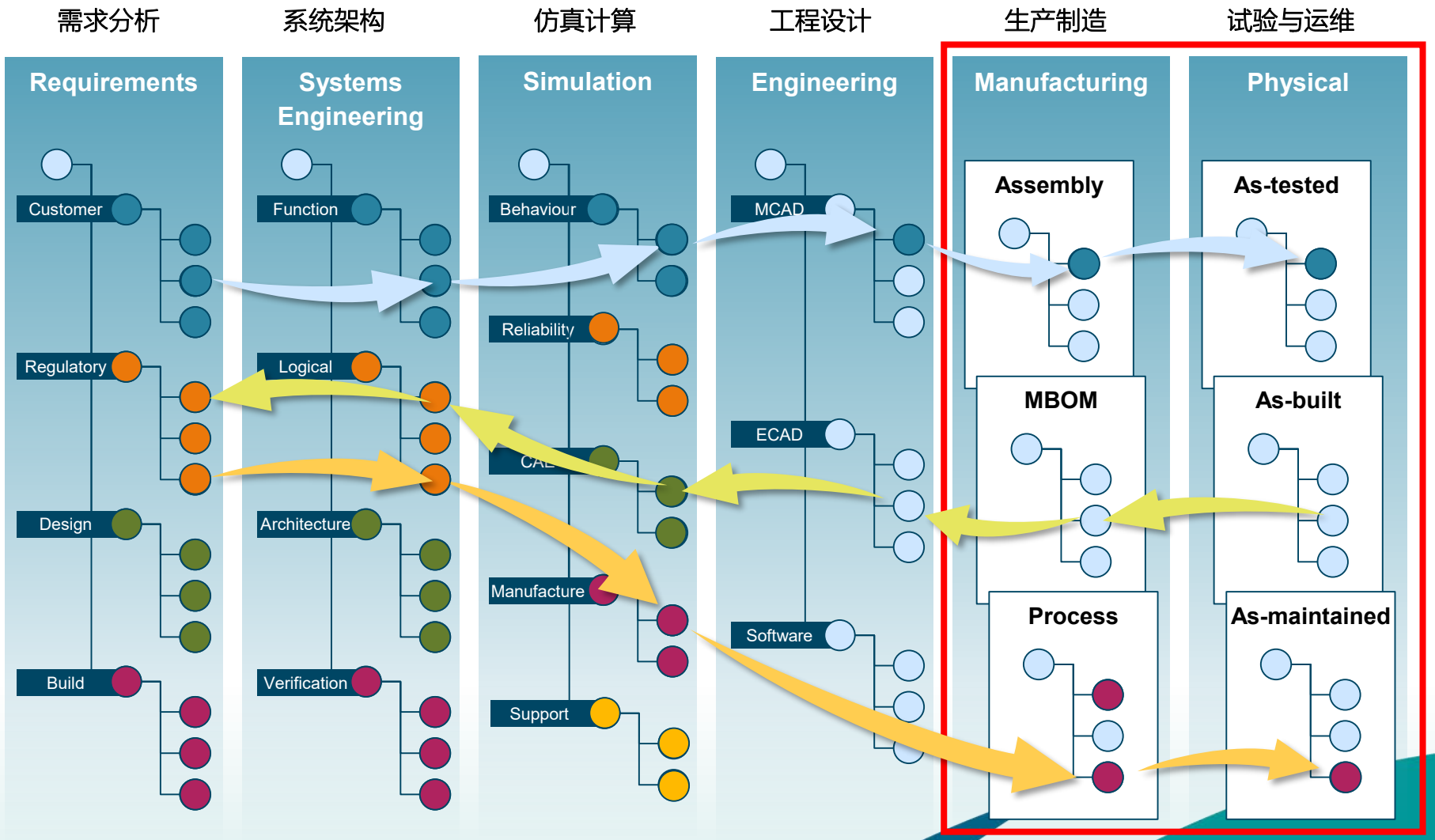
Digitalize your manufacturing

by leveraging a **digital thread** of data from product design to manufacturing, to create a **digital twin** of your production facilities and processes.

通过利用从产品设计到生产的数据所形成的**数字主线**，来创造出您生产资源以及工艺的**数字化双胞胎**，从而**数字化您的制造业**



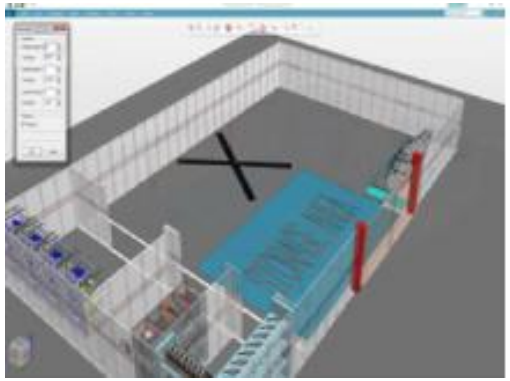
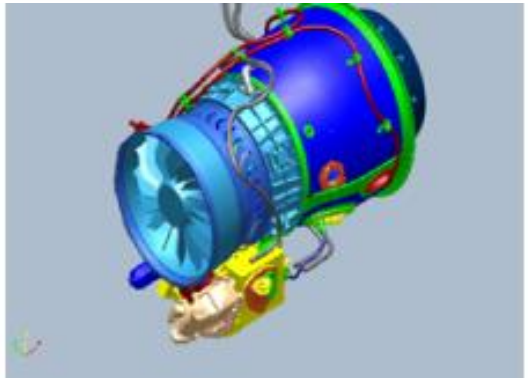
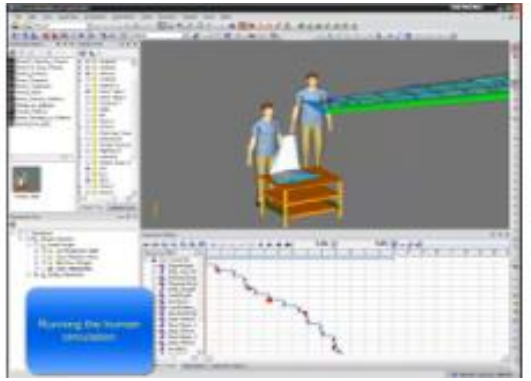
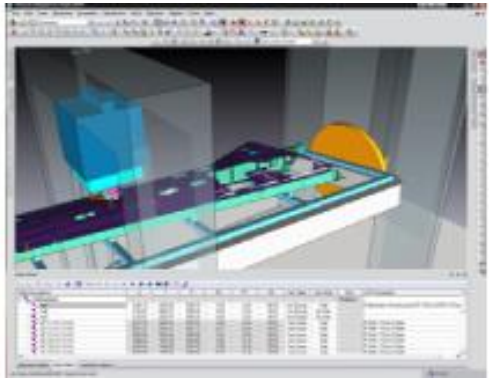
Digital Thread - Connected and Integrated Data
数字主线—实现数据的连接和集成



Optimize & Validate the Assembly Process
优化和验证产品装配工艺

Collaborative digital mockup (DMU), enabling 3D simulation, analysis and documentation

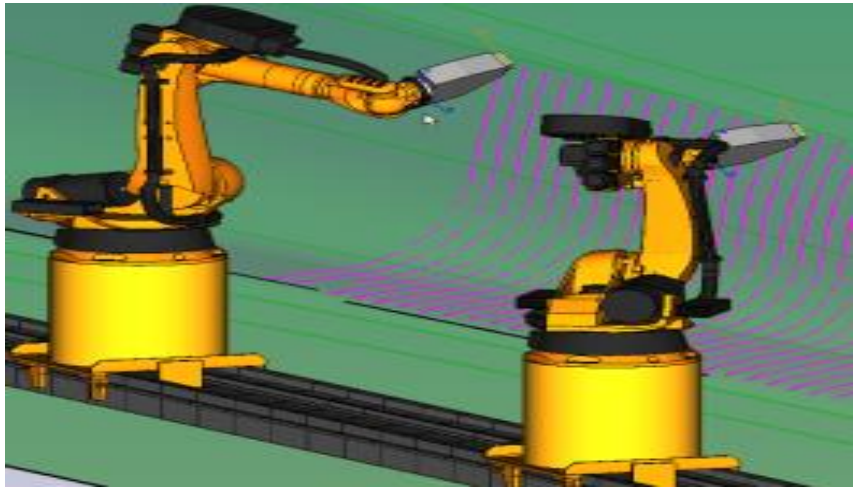
协同数字样机（DMU），实现三维的仿真、分析和文档应用

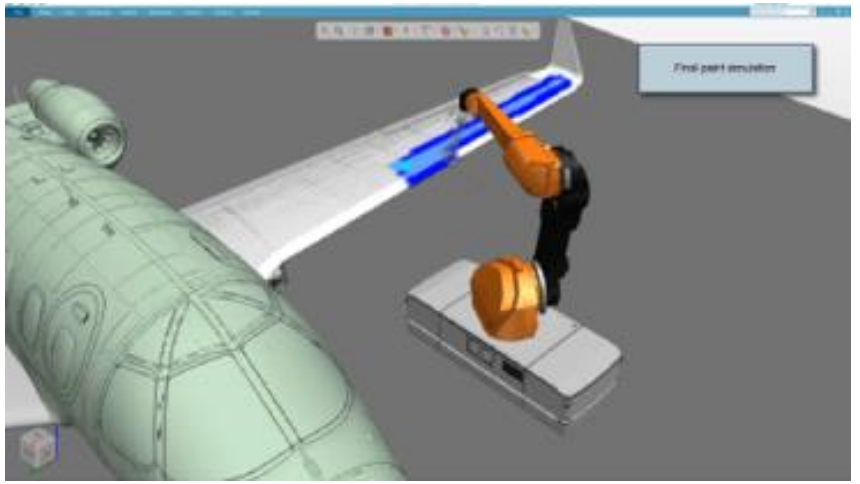
Layout planning 工厂布局规划	Assy / dis-assembly 装配/拆卸仿真	Manual assembly 人工位装配仿真	Automated assembly 自动化装配仿真
			

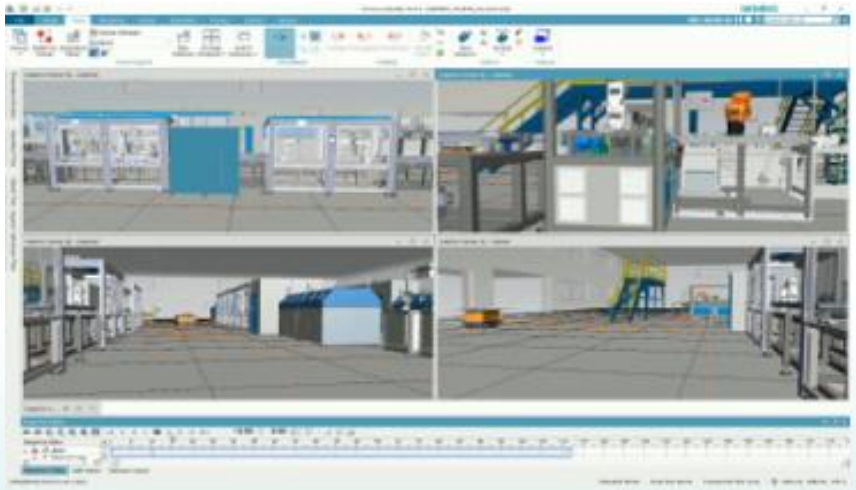
Process Simulate
工艺仿真

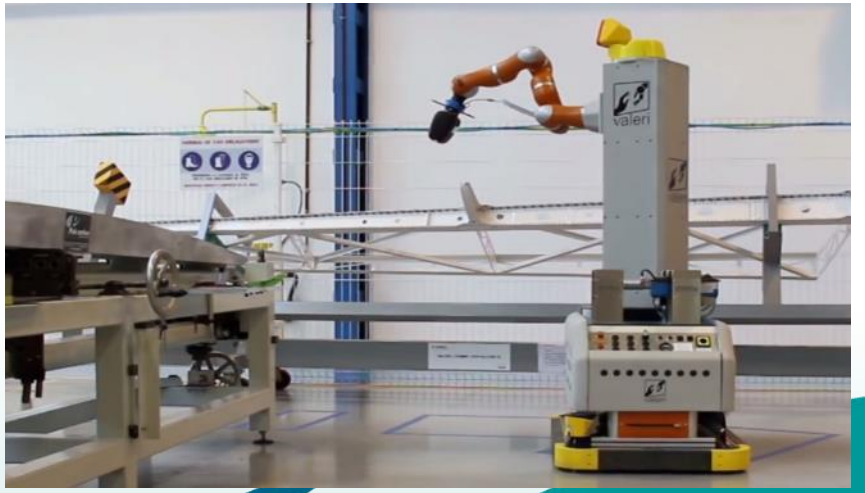
Teamcenter Manufacturing Process Planner
Teamcenter制造工艺规划器

Bring the Tool to the Product
工具围绕产品生产进行自动流转

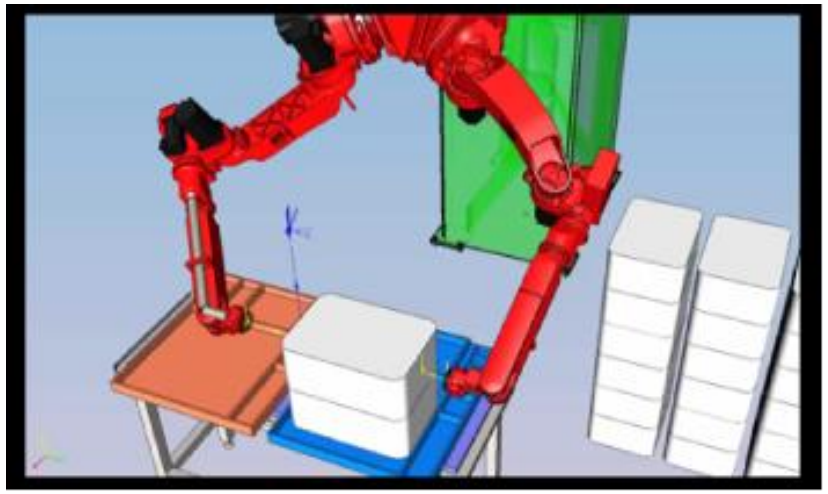


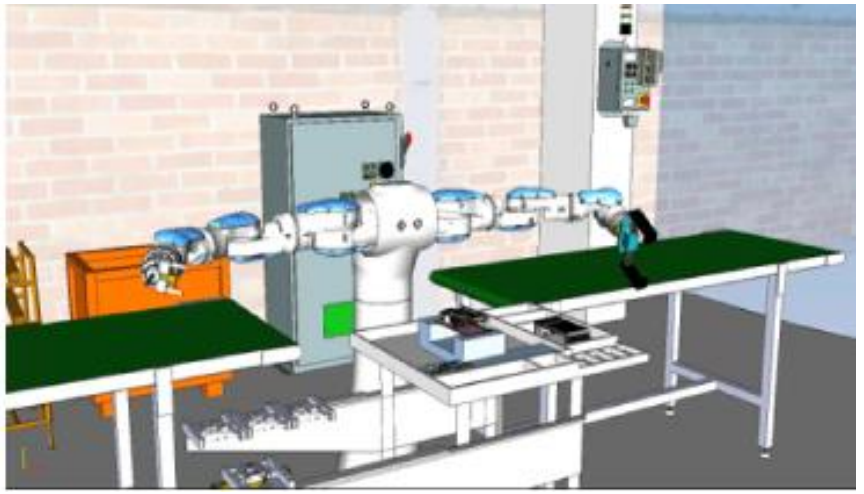


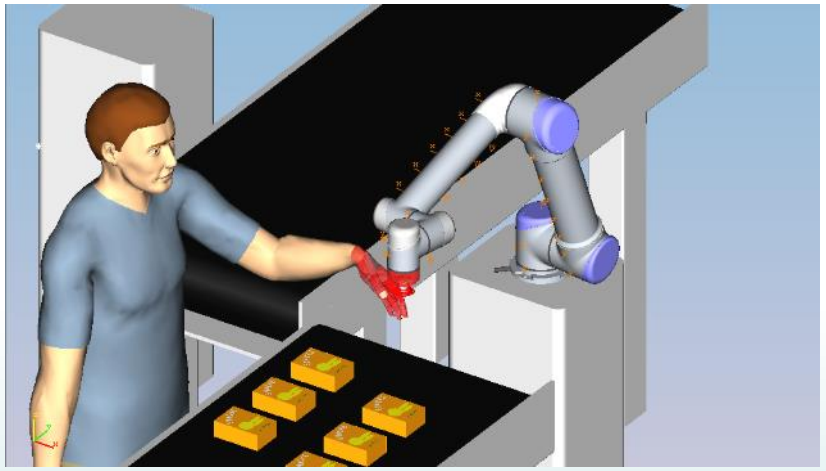




Advanced Robotics & Cobot (cooperative robot)
先进机器人及协作机器人

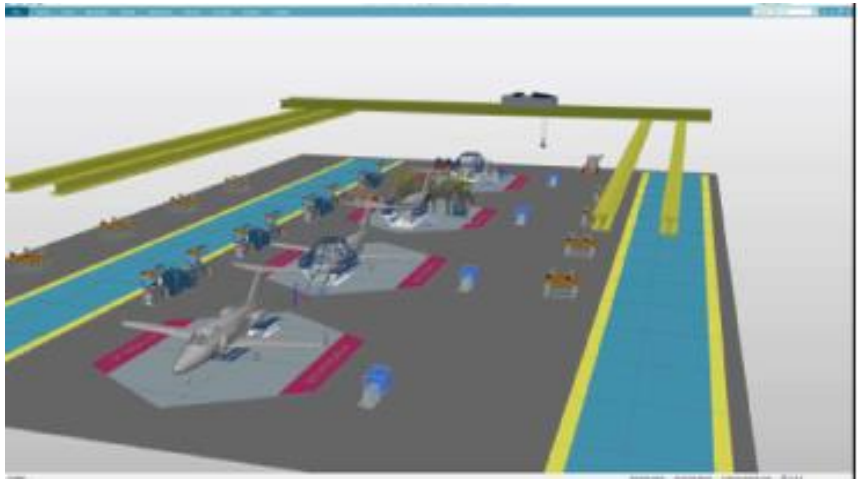


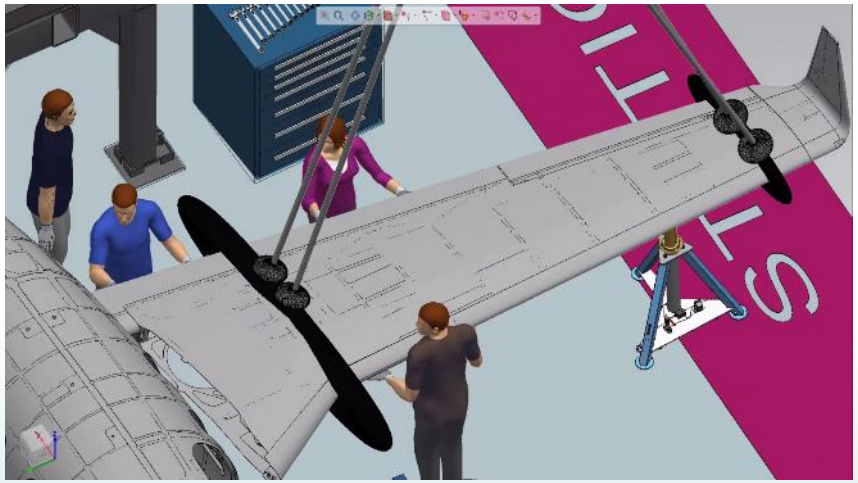




Assembly Process Validation
装配工艺验证

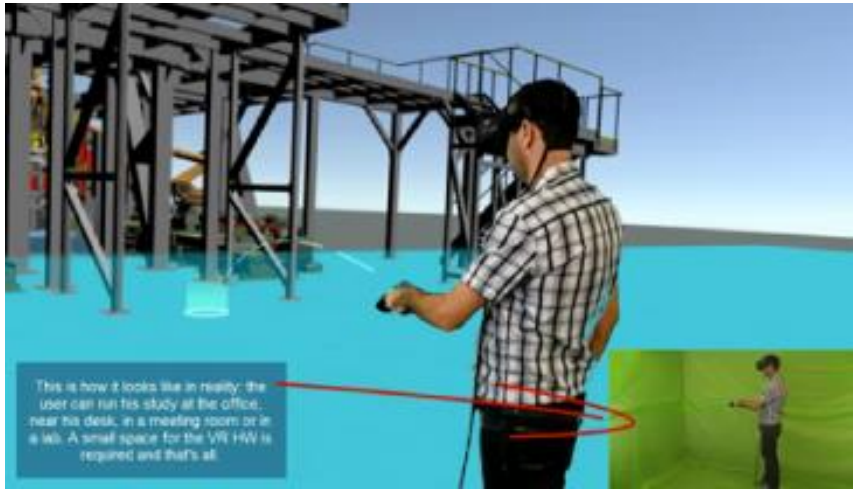
- Collision avoidance / safety distance analysis, while moving large objects.
  分析移动大型零部件时避免碰撞的安全距离。
- Simultaneous human-tool simulation enables realistic validation
  同时进行人员与工具的联合仿真, 实现逼真的验证





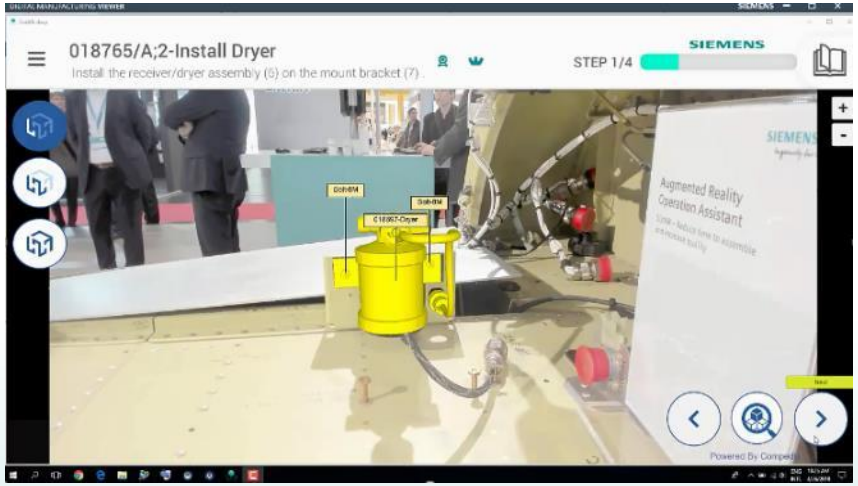
Factory Exploration with Virtual Reality (VR)
基于虚拟实现技术（VR）的工厂漫游

- Realistic 3D navigation through the manufacturing process
  实现生产制造过程的三维实景导航
- Walk through the plant, and ensure the process is feasible.
  通过身临其境的车间漫游，体验并确认生产工艺过程的可行性

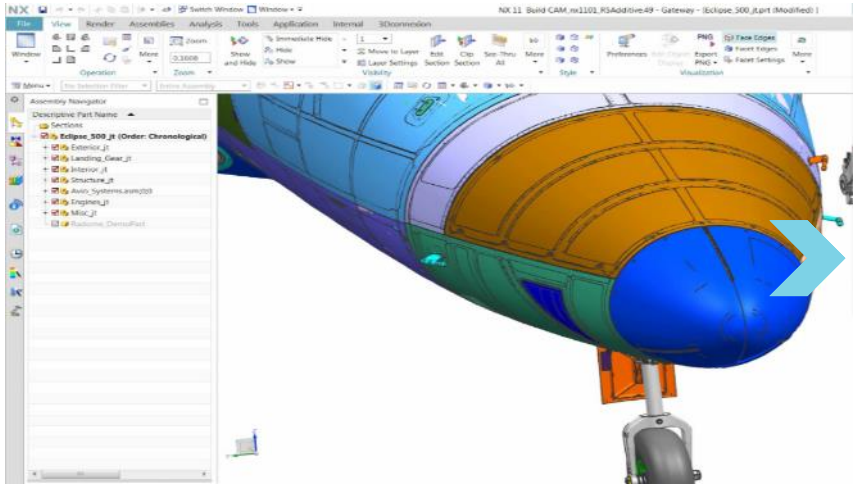


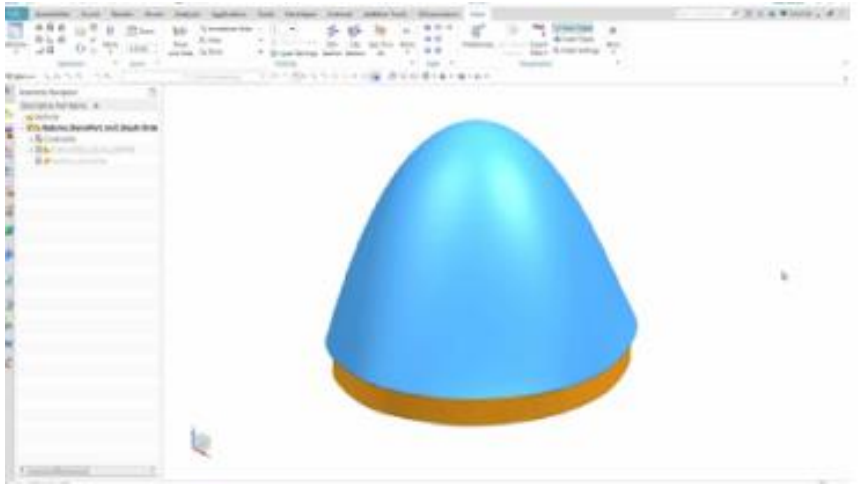
Augmented Work Instructions (AR)
基于增强现实技术（AR）的作业指导书

- Configured, templated and animated work instructions
  配置化、模板化和交互式的作业指导书
- Guidance of assembly work, through digital projection on physical data
  通过基于物理数据的数字投影指导装配工作



Print the Most Complex Aerospace & tooling Parts
打印最复杂的航空航天器零件和模具零件





Summary|总结

- Manufacturing digital transformation is key to survive, not a ‘nice to have’…
  制造数字化转型是生存的关键, 而不仅仅是 "值得拥有"。

- Digital transformation is based on establishing a ‘digital thread’, and a manufacturing ‘digital twin’
  数字化转型的基础是建立“数字主线”, 以及生产的“数字双胞胎”。

- Siemens is a strong partner, which can lead you through the digitalization journey
  西门子是一位强大的合作伙伴, 可以带领您完成数字化转型之旅。